



U. P. A. S. I.

TEA SCIENTIFIC SECTION

ANNUAL REPORT 1942-43

I have the honour to present the annual administration report of the Tea Scientific Section for 1942-43.

Staff.—There were no changes in staff during the year and the arrangements instituted last year have continued.

Correspondence.—677 letters were received and 792 letters despatched during the year.

Touring.—The Acting Tea Scientific Officer visited the Tea Station for varying periods in May and June, August, October, December and January and March in connection with the work of the Section. A visit was also paid to the Anamallais in April, part of the time being devoted to tea problems.

The Mycologist visited the Anamallais in connection with Black Rot spraying experiment and the High Range in connection with a rather serious disease situation associated with *Cercospora*.

The Chemist visited the Anamallais in January in connection with the manuring experiments there and visited several estates to discuss soil problems.

Publications.—A paper on the deterioration of Grevilleas by the Mycologist was published in the *Planters' Chronicle* during the year and reprinted subsequently as a bulletin.

Buildings.—Repairs and upkeep of buildings were attended to and the extensive repairs to the Mycologist's bungalow which were recommended last year were carried out during the year.

Water Supply.—The water supply has been placed on a more satisfactory basis during the year.

Experimental and Research Work.—The plans and programme made last year have been adhered to. The only additional work undertaken has been the design of an experiment to study methods of improving an area of tea in the High Range which suffers badly from *Cercospora*. This is under the supervision of the Mycologist.

Field Experiments.—The field experiments reported last year have been continued, in so far as yield recording was concerned, but it is to be regretted that several manuring experiments have suffered interruptions, largely arising from staff changes both at the Station and on co-operating estates. Arrangements have been made for all these experiments to be recommenced with the

next pruning cycle and most of them have already been manured in accordance with the programme. It may be noted that the interruptions in manuring have not been without practical interest as will appear below.

Owing to pressure of work, it has not proved possible to prepare the full analysis of the data from all the various experiments this year. The actual treatment yields are, however, given below and the details of the treatments will be found in the 1941-42 report.

I. PLANT FOOD REQUIREMENTS.

(a) 27 Plot ($3 \times 3 \times 3$ Factorial) Experiments.

(1) *Tea Experiment Station*.—This experiment was continued and the second year's yields are now available and are shown in Table I.

TABLE I.

<i>Nitrogen</i>		0 lbs.	40 lbs.	80 lbs.				
Yield	...	1155.3	1307.0	1520.7	lbs. made tea/acre.			
<i>Phosphoric Acid</i>		0 lbs.	20 lbs.	40 lbs.				
Yield	...	1274.7	1368.7	1339.7	"	"	"	"
<i>Potash</i>		0 lbs.	20 lbs.	40 lbs.				
Yield	...	1350.3	1261.3	1371.3	"	"	"	"
Significant difference ($P. = .05$) = 106.1 lbs.								

This year's data show a marked significant effect from the nitrogen application which shows no signs of falling off with the heaviest dressing. The response to nitrogen is much higher in this year than in the first, confirming results obtained elsewhere. Thus in 1940-41, the first year from pruning, the gain in lbs. of tea per lb. of nitrogen was about 2 lbs. whereas in the second year it is slightly more than $4\frac{1}{2}$ lbs. The calculated yields per acre are very high, a feature of most experiments where plucking is closely supervised and regular. This feature was commented upon last year in connection with another experiment.

The experiment shows a difference between the 20 lbs. and the 40 lbs. dressing of potash just exceeding the significant difference. Little reliance can be placed on this at the moment.

The interaction between nitrogen and phosphoric acid is highly significant as is shown in Table II.

TABLE II.

		<i>Nitrogen</i>		
		0 lbs.	40 lbs.	80 lbs.
<i>Phosphoric Acid</i>	0 lbs.	1121	1269	1434
"	20 lbs.	1391	1281	1434
"	40 lbs.	954	1371	1694
Significant difference ($P. = .05$)		183.8 lbs.		

These results resemble those obtained last year, a depression of the yield with the heavier phosphate dressing over that with the lower dressing. In addition, in the present year, the 20 lbs. of phosphoric acid has given a significant increase over no phosphoric acid in the absence of nitrogen and the 40 lbs. of phosphoric acid has given a definite increase over none and 20 lbs. in the presence of the heaviest nitrogen application.

As was pointed out last year, this type of experiment is not highly sensitive and there is occasional risk of confusing chance differences with real ones. These interactions of phosphate and nitrogen are of interest as pointing the way to a more thorough exploration of the problem. The indications are that with heavy dressings of nitrogen the phosphate supply becomes important but that in the absence of nitrogen heavy dressings may be harmful.

(2) *Nilgiris (Terramia)*. Owing to an unfortunate error in applying the manures to this experiment in 1941, the experimental design was upset. The error resulted in the plots which should have received potash getting additional amounts of nitrogen. Thus, plots which should have received 40 lbs. of potash, received instead 16 lbs. of nitrogen so that there were plots which received nearly 100 lbs. of nitrogen.

The yields for the year 1941-42, the second year from pruning, are therefore unsuitable for analysis according to the design of the experiment.

However, the yields of the plots receiving various quantities of nitrogen, fail to show the slightest effect from the manure. There are nine sets of three plots each receiving nitrogen as given, with the yields of made tea per acre, in Table III.

TABLE III.

	lbs. made tea		lbs. made tea		lbs. made tea
No Nitrogen	874.4	40 lbs. N.	809.5	80 lbs. N.	850.6
8 lbs. Nitrogen	917.3	48 lbs. N.	923.0	88 lbs. N.	878.6
16 lbs. Nitrogen	846.3	56 lbs. N.	867.4	96 lbs. N.	865.0

It is clear that the differences are all of a random nature and judging by the initial fertility trial, no greater than can occur by chance.

This complete absence of any sign of response is of very great interest but no explanation can be offered at the moment. It is hoped to recommence the experiment with the next pruning cycle, and in the meantime, plot yields are being maintained.

(3) *Anamallais (Mudis)*. The fertiliser application was omitted in October 1941, so that the yields for 1941-42 should show any residual effects of the manures. The experiment will be recommenced on the same plots with the new pruning cycle. The yields are given in Table IV.

TABLE IV.

<i>Nitrogen</i>	...	0 lbs.	30 lbs.	60 lbs.	
Yield	...	659.6	675.1	693.3	lbs. made tea per acre.
<i>Phosphoric Acid</i>	...	0 lbs.	20 lbs.	40 lbs.	
Yield	...	666.1	685.2	673.7	„ „ „ „
<i>Potash</i>	...	0 lbs.	20 lbs.	40 lbs.	
Yield	...	672.5	674.6	680.8	„ „ „ „

It can be seen that the figures show very small differences and although the statistical calculations have not yet been made it is extremely unlikely that any differences are significant. For comparison the yields for nitrogen

applications in 1940-41 are given in Table V along with the same yields for 1941-42, expressed as percentages of the no nitrogen yields.

TABLE V.

	No Nitrogen	30 lbs. N.	60 lbs. N.
1940-41	100	108.5	119.2
1941-42	100	102.3	105.0

The single application of fertiliser in 1940 has obviously had little or no residual effect in the second year.

(4) *Nilgiri-Wynaad (Mayfield)*. This experiment completed its pruning cycle in the current year and pluckings between April and October, 25 in all, were recorded before pruning. The data in the form of lbs. of green leaf harvested in the 7 months are given in Table VI.

TABLE VI.

<i>Nitrogen</i>	...	0 lbs.	30 lbs.	60 lbs.					
Yields	...	1024	1116	1108	lbs. green leaf from 9 plots.				
<i>Phosphoric Acid</i>	...	0 lbs.	20 lbs.	40 lbs.					
Yields	...	1193	1088	967	"	"	"	"	"
<i>Potash</i>	...	0 lbs.	20 lbs.	40 lbs.					
Yields	...	1159	1055	1034	"	"	"	"	"

The differences are not significant, if the yields of the initial fertility trial are taken into consideration.

This result is striking in that this experiment was conducted on land close to the Experiment Station, of the same general type and under similar climatic conditions. Large differences occur, however, in the condition of tea. The tea at the Station is young and with practically no shade, whereas the tea in the experimental block at Mayfield is much older, shade is fairly heavy and a large number of bushes in every plot had been rested. A correction of the plot yields to compensate for the varying numbers of bushes in plucking did not serve to reveal definite differences.

All the tea is being plucked in the pruning cycle just commenced and the experiment is being continued. Future results will be of the greatest interest in the relation of manuring response to bush condition and shade.

(b) *48 Plot (8 × 6 Randomised Block) Experiment.*

(1) *Anamallais (Mudis)*. This experiment also missed its fertiliser application in 1941 and has been recommenced with the new pruning cycle. 38 plucking rounds were recorded prior to pruning.

The yield data for the plots are given in Table VII.

TABLE VII.

<i>Nitrogen</i>	...	0 lbs.	40 lbs.					
Yield	...	648.1	657.3	lbs. made tea per acre.				
<i>Phosphoric Acid</i>	...	0 lbs.	30 lbs.					
Yield	...	650.6	654.8	"	"	"	"	"
<i>Potash</i>	...	0 lbs.	30 lbs.					
Yield	...	658.1	647.3	"	"	"	"	"

These results resemble those of the other experiment which missed its second fertiliser application. The gain from the nitrogen application in 1940-41 amounted to 8% which was significant, but this has fallen to a quite insignificant difference of 1% in 1941-42.

II. APPLICATION OF NITROGENOUS MANURES

(1) *Nilgiri-Wynaad (Rockwood)*. The experiment reported last year has been replaced by a new experiment on more uniform tea and initial yields are being recorded until pruning in 1943, when the treatments will be applied.

A revised analysis of the data in the previous experiment has revealed that the larger yield in the plots receiving 60 lbs. of nitrogen in 1941-42 was significant at a probability of 20 to 1.

(2) *Anamallais (Iyerpadi)*. This experiment has failed to show any significant effect from the nitrogen applications and the area has been utilised for fresh experimental treatment involving mulching and compost.

III. BULK MANURES

(1) *Anamallais (Mudis)*. This area was pruned during the year and 21 rounds were recorded before pruning. The yields showed no significant differences. No application of manure was made in the hot weather of 1942, but the treatments are to be resumed in the hot weather of 1943.

(2) *Nilgiris (Terramia)*. This experiment was continued during the year. The yields are given in Table VIII together with those of 1940-41, as the figures given in the last report were incorrectly calculated from the green leaf data.

TABLE VIII.

	Rounds	Compost + NPK	Compost + N	NPK
Yield 1940-41	14	285.0	275.0	283.0
1941-42	40	781.0	756.5	725.0

The differences are not significant.

IV. TIME OF MANURE APPLICATION

This experiment also missed its manure application in 1941, but has been recommenced with the new pruning cycle. The yields for the 40 rounds in 1941-42 showed no appreciable differences.

V. WEEDING

This experiment completed its pruning cycle during the year and the yields continued to show no significant differences.

VI. PRUNING AND RESTING EXPERIMENTS

(1) *Pruning Method (Anamallais-Mudis)*. The second year's yields of this experiment and the details of the treatments are given in Table IX.

TABLE IX.

	Yield in lbs. made tea.	Average
Low Prune, Low Tip (14" and 5")	751.7	} 763.2
Low Prune, High Tip (14" and 9")	774.7	
Medium Prune, Low Tip (20" and 5")	749.8	} 775.0
Medium Prune, High Tip (20" and 9")	800.2	

No differences are significant.

The advantage of the medium prune is not maintained at a significant level in the second year. It is of interest to note that the high tipped plots have given rather higher yields than the low tipped plots, which is the reverse of the position in the first year. No significance can be attached to these figures however.

(2) *Pruning Method (Travancore-Ambanaad)*. This experiment was skiffed in December 1941 and plucked for 9 rounds to the end of March 1942. The yields for this short period showed no significant features and the experiment has been discussed by the Entomologist.

(3) *Pruning Method (Travancore-Ambanaad)*. This experiment is now in its third year and the yields for this year are given in Table X.

TABLE X.

	1942	
18" Prune, 12" Tip	1369.2 lbs.	} 1350.2 lbs.
18" Prune, 6" Tip	1331.2 lbs.	
27" Prune, 12" Tip	1518.4 lbs.	} 1439.6 lbs.
27" Prune, 6" Tip	1360.8 lbs.	

No differences are significant, but the average of the higher pruned plots is still higher than that of the lower pruned plots. The higher tipped plots have both shown a higher yield than the lower tipped plots which is especially marked in the 27" prune. No significance can be attached to the data, but the trend of the results is similar to that shown in the Anamallais experiment.

(4) *Pruning and Resting (Experiment Station)*. This experiment is in its second year and the yields are given in Table XI.

TABLE XI.

	Pluckings	Yields.
Rested 3 months before Pruning	47	761.1 lbs.
Normal Treatment	"	876.8 "
Rested 6 months after Pruning	"	884.1 "

The statistical calculation of these data has not yet been carried out but it looks as if the rest before pruning has not helped the yield of the plots so treated.

(5) *Pruning and Resting Experiment (Experiment Station).* This experiment has been continued, but it has proved impossible to complete the examination of the data so far accumulated. These have been recorded and will be analysed and discussed later.

VII. CULTIVATION

Forking.—This experiment, which was superimposed on experiment VI (4) above, has been continued and the yields are given in Table XII.

TABLE XII.

Forked	...	841.4 lbs. made tea per acre.
Not forked	...	795.0 „ „ „ „ „

The relative position of the two treatments has not changed so far. The experiment is continuing.

VIII. CONTROL OF BLACK ROT

This experiment is in charge of the Mycologist who discusses the results in his report.

Work of the Staff.—The reports of the Entomologist, Mycologist and Soil Chemist are appended. In accordance with the practice followed last year, a few notes are given on the work to relate it to the general practice of tea cultivation.

Entomologist.—The main problem of the Entomologist in S. Indian tea remains *Helopeltis* and considerable thought and discussion has been devoted to devising fresh lines of approach to the problem. Three lines of work were noted last year but little progress has been possible. The rate of development of the trap plant has proved slow and has been seriously interfered with by the pest itself. It looks as if some direct control measures will have to be employed against the insect in order to establish the trap plant. This adds to the expense and tends to reduce the likelihood of a successful use of the method. The trial of direct measures of control by insecticides has been checked by the shortage of supplies of suitable material.

As has been pointed out previously, the absence of this insect as a pest in the neighbourhood of the Experiment Station adds to the difficulty of investigation.

It may be of interest to remark as an addition to the Entomologist's note on hand-catching, that a thorough study of hand-catching of *Antestia*, a sucking bug attacking coffee in East Africa, showed the impossibility of securing successful control of such insects by this method.

The work on eelworm (*Heterodera marioni*) has been fully reported by the Entomologist. The use of *Tephrosia vogelii* as a test plant has shown definite promise and work on this method is being extended. The trials of soil sterilisation methods has also enabled us to advise estates with more certainty on the treatment of infested soils, where such soils have to be used. As a side issue of this work, the extremely vigorous growth of tea plants in a steam-sterilised soil may be noted. The method is not applicable to large scale propagation of tea but it is of interest as the growth obtained was most striking in comparison with the growth in pots with a very low eelworm population.

The other work of the Entomologist is of more restricted interest, being concerned mainly with insects of local or occasional importance. The notes on a thrips attack in the Nilgiris are of some interest and illustrate the value of detailed reports on insect outbreaks in helping to build up information on the factors involved. With pests which are of irregular occurrence it is very difficult to get information on which sound advice can be given and it is only by the fullest recording of all the circumstances under which attacks occur that the necessary body of data can be accumulated. For this, the co-operation of all planters is essential. I would like to emphasise this point here since cases are all too frequent of specimens or reports of diseases and pests being received without any details of the status, circumstances or conditions under which the disease or pest has occurred. In the absence of such information, it is impossible to advise on control measures and the accumulation of information which will eventually be of value is seriously hindered.

Mycologist.—As will be seen from the report, attention has been devoted to two diseases in particular—Black Rot and *Cercospora*. The value of spraying for the former disease has been demonstrated and it appears certain that with a more thorough study of the mode of application of the fungicide, Black Rot in tea in South India can be controlled as efficiently as Black Rot of coffee.

The work on the carbohydrate reserves of tea stumps was continued and the study of material from lower elevation has proved of considerable interest. As was expected, the carbohydrate reserves of the tea stumps from lower elevations were lower than those of stumps from higher elevations. The data obtained are being studied in detail and will be fully reported later. It may be observed, however, that they show signs of definite fluctuations in relation to seasonal conditions, which are largely absent in material from higher elevations.

The study of the stumps planted in the Station nursery will be commenced in the coming year.

Little progress has been made in the study of the *Albizzia* disease reported last year, but work is continuing in view of the extensive planting of this tree in South Indian tea areas, and the potential seriousness of a disease of the type reported. The difficulties involved in the work have lain in the provision of material of the *Albizzia* for inoculation, and these can only be overcome with time. Seedlings have been established and inoculation experiments with the fungi isolated are planned.

Soil Chemist.—The remarks made last year on the value of soil analyses in interpreting the good or poor development of tea have been confirmed in the current year. On the whole, enquiries for soil analysis have been limited to the solution of specific problems of comparison of good and poor areas, but only in one or two cases has it been possible to correlate the data with the condition of the tea.

The work on the decomposition of organic residues commonly found on tea estates is approaching completion and the results will be worked up in the coming year into a comprehensive account of the work done.

It may be of interest to draw attention to the fact that of 32 manure mixtures submitted for analysis, not one has fallen below the guaranteed analysis.